

## NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

### MULCHING

(acre)  
CODE 484

#### DEFINITION

Applying plant residues or other suitable materials not produced on the site to the soil surface.

#### PURPOSE

To conserve moisture; prevent surface compaction or crusting; reduce runoff and erosion; control weeds; and help establish plant cover.

#### CONDITIONS WHERE PRACTICE APPLIES

On soils subject to erosion on which low-residue-producing crops, such as grapes and small fruits, are grown; on critical areas; and on soils that have low infiltration rates.

#### PLANNING CONSIDERATIONS

Mulch may be desirable to provide necessary wind or water erosion control on various land uses or is sometimes used to support the cropping system. The need for mulching should be based on guidance listed in appropriate planting standards and specifications (i.e., Critical Area Planting, Land Reconstruction, Recreation Area Improvement, Grassed Waterway or Outlet, etc.) and the Wind and Water Erosion Handbook.

The application of plant residue or other suitable material may reduce sediment yields by reducing runoff and erosion. Surface cover may also increase microbial action the soil surface, improve infiltration, reduce evaporation, and lower soil temperatures.

#### A. Water Quantity

The quantity of available surface water may be decreased by reduced surface runoff and increased infiltration.

Deep percolation and ground water recharge may increase through increased infiltration and reduced evaporation depending on geologic and hydrologic conditions.

#### B. Water Quality

Sediment and sediment attached pollutants may be reduced as runoff and erosion is decreased.

Increased deep percolation may increase movement of pesticides, nutrients, and minerals to ground waters depending on soil and geologic condition.

Increased infiltration and decreased evaporation may increase ground water available for plant use.

#### SPECIFICATIONS

##### I. Cropland Fields – The following shall be used as a guide for cropland fields:

##### A. Cotton Burs

1. Water Erosion Control – Follow guidance in the water erosion section of the Erosion Handbook. Consider the rates used, “F” crop stage period, and the appropriate “C” value.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

2. Wind Erosion Control – Follow guidance in the wind erosion section of the Erosion Handbook regarding the rate and the equivalent value in flat small grain residue. Test the flat small grain rate used to estimate the wind erosion occurring during the period the mulch is on the surface.
- B. Small grain straw, grass hay, or similar stem diameter residue
1. Water Erosion Control – Follow guidance in the water erosion section of the Erosion Handbook. Consider the rates used, “F” crop stage period, and the appropriate “C” value.
  2. Wind Erosion Control – Follow guidance in the wind erosion section of the Erosion Handbook regarding the rate and the equivalent value in flat small grain residue. Test the flat small grain rate used to estimate the wind erosion occurring during the period the mulch is on the surface.
- C. Barnyard Manure (mixed with straw or hay, or in a lumpy form that will not blow or float away)
1. Water Erosion Control – Follow guidance in the water erosion section of the Erosion Handbook to obtain a “C” value based on yields resulting from increased fertility.
  2. Wind Erosion Control – Follow guidance in the wind erosion section of the Erosion Handbook regarding the rate and the equivalent value in flat small grain residue. Test the rate used, during the period manure is on the surface, to estimate the wind erosion occurring during the period of time.
- II. Critical Areas – Land Reconstruction, Grassed Waterways or Outlet, Recreation Area Improvement, Cut and Fill Slopes and Construction Sites
- A. Mulch materials and application  
(Materials such as cotton burs, hay, or straw may be applied prior to seeding operations. When applied prior to seeding, a grass seed drill equipped with disk openers is recommended to retain the effective mulch benefits and place seeds into the mineral soil).
1. Hay Mulch
    - a. Mulch Material: Perennial native or introduced grass – Weeping lovegrass, K.R. Bluestem, kleingrass, or bermudagrass hays could be used. At least 50 percent of the herbage by weight must be 10 inches or longer before being applied to the site. Seed hay may be used if the same as the species used in the seeding. Otherwise, hay should be free of seed.
    - b. Spread Uniformly: Spread by hand or mechanically at the rate shown on Table 1. When spread by hand, the bales of hay must be torn apart, “fluffed up”, and spread uniformly over the area. For uniform distribution of hand-spread mulch, divide area into approximately 1,000 square-foot sections. Place the mulch by these sections for uniform distribution. Mechanically applied mulches shall not be applied when wind velocities exceed 15 miles per hour. The machine will be adjusted so as not to cut the hay in pieces not less than 6 inches in length.

c. Hay will be anchored using one of the following methods:

- 1) Peg and Twine – Drive 8 to 10 inch wooden pegs to within 2 or 3 inches of the soil surface every 4 feet in all directions. Stakes should be driven before applying mulch to soil surface by stretching twine between pegs in a criss-cross within a square pattern. Secure twine around each peg with 2 or more round turns or a clove hitch.
- 2) Mulch Nettings – Staple lightweight jute, cotton, or plastic netting to the soil surface. Netting is usually available in rolls 4 feet wide and up to 300 feet long. Mesh size of fabric shall not exceed 1½ inches by 3 inches. Staples used to secure the netting will be of 11-gauge wire formed into a U-shape 6 inches long. Mesh will be rolled out in place in the direction of water flow. The up-channel or slope end of each piece of material will be buried in a narrow trench 4 to 6 inches deep. Overlap at least 4 inches to rolls applied side by side and at least 18 inches where one roll stops and the next roll starts. Mesh shall be stapled at joints, corners, and approximately 5-foot intervals along the sides and down the center.
- 3) Hand Slit Anchored – Applicable to areas not accessible to conventional equipment. Use dull square end spade. Press mulch into the soil surface

on the contour in rows not to exceed 12 inches apart.

- 4) Mechanical Mulch Anchoring – Tools – Use a heavy straight disk-type mulch tiller. The disk should be ¼ inch thick and be of sufficient diameter to prevent the frame from dragging the mulch. The edges should be dull so as not to cut the mulched hay during the anchoring operation. The edges may be serrated or smooth; if serrated, the scallops should not be more than 3 inches in length and ¾ inch in depth. The rows or furrows made by the mulch tiller shall be spaced not more than 9 inches apart. Penetration depth should be 2 to 3 inches. The hay should not be covered with excessive amounts of soil. Limit to no more than 2 passes by the disk. All mulching operations will be done on the approximate contour. A farm disk set straight may be used if weight is added to provide for penetration depths and providing it tucks the material without cutting. Travel speeds must be reduced to prevent excessive burial of mulch material.
- 5) Asphalt Emulsion Tack – Asphalt emulsion shall consist of liquid emulsions of water and natural bituminous asphalt grades SS-1, SS-K or SS-Kh, SM-K, MS-Z, RS-1, RS-2, CRS-1, or CRS-2, CM-K or equivalent. The asphalt emulsion will be continuously applied with

an emulsion spray system equipped with a mechanical mulch hay blower. Application temperature will be 50 degrees F or greater (air temperature). The asphalt shall be applied with a mechanical mulch blower equipped with an emulsion spray system having a heating unit. Follow rates shown in Table 1.

- 6) Resin Emulsion Mulch Tack – Shall consist of liquid emulsion of water and natural petroleum resins of a type AH. The resin shall be applied with a hydromulcher. Follow rates shown in Table 1.

## 2. Wood Fiber Mulch

- a. Materials shall be cut from sound green timber. The cut shall be made in such a manner to provide a majority of the fiber to be 4 inches in length. Fiber size will be .024 inch to .031 inch, plus or minus 20 percent.

- b. To avoid temporary nitrogen deficiency, apply a minimum of 20 pounds of nitrogen for each ton of wood fiber used. This nitrogen requirement is in addition to fertility needed for plant establishment.

- c. Apply wood fiber mulch with conventional mulch spreaders or by hand at the hay rates shown in Table 1. Refer to guidance listed for hay mulch (Item II-A, 1., b.).

- d. Experience has shown that asphalt tack or other methods of holding wood fiber in place is generally not needed. Wood fiber mulch may be anchored using methods listed for hay.

- e. Rates for hay in the Erosion Handbook are applicable to wood fiber mulch.

## 3. Cotton Bur Mulch

- a. Cotton burs shall not be weathered, rotted, brittle, molded, or contain an excessive amount of dirt. Burs shall not contain an excessive amount of noxious weed seed or other competitive plant seed.

Table 1. Application rates for hay, using various methods of anchoring.

Method of Anchoring and Mulch	Rate for Mulch (Pounds) <sup>1/</sup>		Rate for Asphalt or Resin Emulsion Tack	
	Per Acre	Per 1000 Sq. ft.	Gallons Per Acre	Gallons per 1000 sq. ft.
Anchored with disk: Native or tame hay	5000	118	-	-
Anchored with Asphalt or Resin: Native or tame hay	3000	70	300	7
Anchored with other: <sup>2/</sup> Native or tame hay	4000	93	-	-

<sup>1/</sup> Rates shown are based on the equivalent of 4000 pounds per acre of flat small grain on the surface. Use Erosion Handbook to determine needs for the site.

<sup>2/</sup> Includes slit, netting, and peg and twine anchoring methods.

- b. Application rates for wind erosion control will be based on converting cotton burs to flat small grain residue equivalent and estimating the erosion rate using the wind section of the Erosion Handbook. Apply uniformly with a mechanical spreader or blower.
- c. Application rates for water erosion control will be based on using 5 tons of burs in lieu of 2 tons of hay; or 3 tons of burs in lieu of 1 ton of hay. Follow guidance in the water section of the Erosion Handbook to determine the appropriate "C" value.

#### 4. Barnyard Manure - Mulch

- a. All manure applied will be of good quality which has not undergone prolonged weathering.
- b. The barnyard manure will be uniformly and evenly applied in the required amounts. No application should be made when the ground is wet, causing tracking or other damage to the ground surface. Apply uniformly with mechanical equipment. However, the application may be made by hand on areas not accessible to large equipment.
- c. Application rates applicable for wind erosion control will be based on converting barnyard manure (dry) to flat small grain equivalent, and then estimating the erosion rate using the wind section of the Erosion Handbook.
- d. Barnyard manure may be used as a fertilizer amendment to enhance growth and vigor of temporary or rapidly developing perennials when estimating

water erosion. Follow guidance for temporary cover or rapidly developing grass in the water section of the Erosion Handbook.

#### 5. Wood Chips or Bark Mulch

These materials are better suited for mulching woody plantings than broadcast seedlings. These materials may be better suited for urban and recreation areas.

- a. Use bark chips with a maximum dimension of 3 inches or shredded particles from the bark, or wood chips with a maximum of 2 inches may be used.
- b. Bark or chip depths of more than 1 inch when spread may affect seedling emergence.
- c. Cover the entire planting area when making mass shrub or vine plantings. For single plantings, spread chips or bark around the base and extend outward 18 inches from the main stem or trunk. Applying 3 or 4 inch depths will assist in controlling competition.
- d. Apply additional fertilizer in subsequent years based upon plant needs to encourage vigorous growth.
- e. Do not use in waterflow areas.
- f. Effective rates for water erosion control can be determined by using the Erosion Handbook.

#### 6. Gravel or Crushed Stone Mulch

- a. When washed road gravel or crushed stone is used as a mulch for seedlings, use size ranging from ¼ to ½ inch in diameter with none larger than ¾ inch. Apply at the rate of

135 tons per acre (about ½ inch average depth) or greater as determined using the Erosion Handbook.

- b. For areas planted for weed control or for foot traffic use, increase to 2 or 3 inch depths (400 –600 tons per acre). The gravel will be no less than ½ inch in size and not in excess of 1 ½ inches in size.
7. Asphalt, Asphalt Emulsion, and Resin Emulsion Mulch
- a. Liquid asphalt or cutback asphalt shall be rapid curing (RC-30, RC-70, RC-250, RC-800) or their equivalent, and shall contain no water.
  - b. Asphalt emulsion shall consist of liquid emulsions of water and natural bituminous asphalt grades of SS-1, SS-K or SS-

Kh, SM-K, MS-2, RS-1, RS-2, CRS-1 or CRS-2, CM-K or their equivalent.

- c. Resin emulsion shall consist of liquid emulsion of water and natural petroleum or acrylic resins prepared specifically for soil stabilization. These materials include products such as: Phillips Petroleum Petroset SB, American Cyanamid Aerospray 70, and American Cyanamid Curasol AH.
- d. Asphalt emulsion and cutback asphalt shall be applied with an emulsion spray system having a heating unit. Resin emulsion shall be applied with a hydromulcher.
- e. Rates of application for resins and asphalt mulches are shown in Table 2.

Table 2. Resins and Asphalt Mulch Rates

Mulch	Soil Type	Rate			
		Cups Per Sq. Yd <sup>1/</sup>		Gallons Per Acre	
		Material	Water	Material	Water
Resin Emulsion <sup>2/</sup> Petroset SB Aerospray 70 Curasol AH	Loamy sands	5/8	6	200	1800
	And	5/8	6	200	1800
	Sandy sands	1/8	6 1/2	60	1940
Petroset SB Aerospray 70 Curasol AH	Loams	5/8	4 ½	200	1300
		5/8	4 ½	200	1300
		1/8	4 1/2	60	1440
Asphalt Emulsion	All soils except silty clays and clays	4	None	1200	None
Cutback Asphalt	All Soils	4	None	1200	None

<sup>1/</sup> Conversion of cups to gallons: 16 cups = 1 gallon

<sup>2/</sup> Not recommended for use on clays

B. Soil Retention Blanket (wood fiber) and Application

1. Soil retention blanket shall be made of a uniform web of interlocking wood fiber, with a backing of mulch net fiber on one side only. The fibers shall be produced from aspen wood and shall be .021 inch by .042 inch plus or minus 25 percent, an minimum of 4 inches in length. The top side shall be covered with a maximum mesh size not to exceed a 2 inch by 1 inch extruded plastic. For longer life and durability, netting with carbon black additive is recommended. Thickness of the blanket shall not be less than ¼ inch before installation. Roll weight shall average .8 pounds per square yard plus or minus 10 percent weight of each roll at the time of manufacturing. This information will be stenciled on the roll wrapper or attached tag.
2. Blanket staples shall be U-shaped, 11-gauge or heavier wire, approximately 2 inches wide at the throat and a minimum of 6 inches in length or equivalent.
3. Place blanket with the netting on top and the fibers in contact with the soil over the entire area covered. The blanket shall be unrolled along the approximate contour of the slope and lapped 4 inches over the adjoining roll. When used in waterflow areas, the blanket shall be unrolled in the direction of flow and lapped 4 inches over the adjoining roll. When using 2 or more blankets side-by-side in a ditch, do not put the seam (edge of adjoining blanket) in the center of the waterflow. Offset 6 inches to 1 foot. In concentrated flow areas, the blanket shall be placed to cover design flow depths. Blanket shall be stapled at joints, corners, and approximately 5 foot intervals along the sides and down the center. Staples should appear as a "5" on dice. The ends and edges shall be

buried to prevent undercutting by water or wind.

4. To avoid temporary nitrogen deficiency, the addition of supplemental nitrogen is needed. Apply 40 pounds of available nitrogen each year for at least 2 years following the year of seeding.

#### C. Jute Mesh and Application

1. Material shall be of uniform, open, plain weave (approximately 1 inch) of unbleached single jute yarn. It can generally be purchased in rolls, approximately 75 yards in length and 48 inches wide. The weight will be approximately 1.22 pounds per linear yard.
2. Apply material by rolling out in the direction of waterflow. Soil surface must be smooth with material in contact with soil. The up-channel or slope end of each piece of the material will be buried in a narrow trench 4 to 6 inches deep. Tamp trench firmly after burial of material edges.
3. Lap 4 inches over the adjoining roll. When using two or more rolls side-by-side in the ditch, do not put the seam (edge of adjoining roll) in the center of waterflow. Offset 6 inches to 1 foot. When one roll ends and a second roll starts, the up-channel piece should overlap the second roll by at least 18 inches.
4. Staple roll to soil using U-shaped, 11-gauge wire, approximately 2 inches wide at the throat and a minimum of 6 inches in length. Roll shall be stapled at joints, corners, and approximately 2 foot intervals along the sides and down the center.
5. Roll area with a smooth roller after applying the jute. Roller should weigh 50 to 75 pounds per foot of length.

D. Erosion Control Fabric (yarn) and Application

1. Material shall consist of a knitted construction of yarn with uniform openings interwoven with strips of biodegradable paper and be furnished in rolls.
  - a. Widths – Can be obtained in 5 or 10 foot minimum widths.
  - b. Length – Normally 360 feet is average length.
  - c. Approximate weight – 0.2 pounds per square yard.
2. Site Preparation – The finished area where the erosion control fabric is to be applied should be smooth, relatively soft, and free from stones, clods, or trash. The area to be covered shall be prepared as a fine seedbed, fertilized and planted prior to installation of erosion control fabric.
3. Applying Erosion Control Fabric (yarn)
  - a. The erosion control fabric will be rolled out in place in the direction of flow. Dig a 4 inch deep check slot 1 foot back from the slope crown; fold, place, and staple fabric every 9 inches in the check slot, and over with soil. Repeat check slot at the bottom of the slope. After the erosion control fabric is buried, the trench will be

tamped firmly. If the slope is greater than 3:1, fabric shall be applied vertically with paper strips oriented to the slopes.

- b. When 2 or more lengths of fabric are to be installed side-by-side to cover an area, they shall overlap 4 inches (minimum). Fabric lengths installed end-to-end shall overlap 4 inches (minimum), with the upgrade section on top of the lower grade section.
  - c. The erosion control fabric material will be applied uniformly and completely over the designated area.
  - d. Best results will be achieved from close ground contact; therefore, during installation, material should be draped loosely over the ground surface, not stretched tightly and smoothly.
4. Stapling Erosion Control Fabric (yarn)
    - a. Staples shall be U-shaped, 11-gauge or heavier wire, approximately 2 inches wide at the throat and a minimum of 6 inches in length or equivalent.
    - b. Each length of fabric shall be stapled in 3 rows; each edge and the center with staples placed on 3 foot centers (maximum). Overlap ends shall be stapled on 9 inch centers across the fabric overlap. Check slots, ends up slope and junctions of new rolls will be stapled across at 9 inch intervals.



## E. Hydromulching

1. Apply 1200 pounds of wood cellulose fiber mulch per acre in approximately 2500 gallons of water. Distribute uniformly over the area.
2. A hydraulic mulcher will be used to apply the slurry. Mixing procedure includes filling equipment tank half full of water, then adding the wood cellulose fiber and grass seed prior to filling the tank with water. Agitation will be continuous and complete to insure a homogeneous mixed slurry.

## F. Curasol AH – Wood Cellulose Mulch

1. Apply 500 pounds of wood cellulose mulch fiber per acre. A green colored wood cellulose serves as a better tracer for uniform distribution. Mix with the Curasol AH at the rate advocated for site conditions as shown in Table 3.
2. A hydraulic mulcher will be used to apply slurry. Fill the equipment half full of water. Add the Curasol AH and wood cellulose fiber (and grass seed). Finish filling the equipment with water. Agitation will be continuous and complete to form a homogeneously mixed slurry.

## 3. Soil Reinforcing Mat

The soil reinforcement mat shall consist of a machine produced mat of Nylon 6 with a minimum content of 0.5% by weight of carbon black. The mat shall be three dimensional with nylon interwoven monofilaments fused at their intersections.

For concentrated waterflow areas, the material shall have a minimum filament diameter of 0.02 inches with a minimum thickness of 0.17 inches, weighing .083 pounds per square foot. The material shall be in a roll approximately 38 inches wide and 328 feet long (116 square yards).

For steep slopes where waterflow is not concentrated, the material shall have a minimum thickness of 0.085 inches with a minimum filter diameter of .014 inches, weighing .05 pounds per square foot. The material shall be in a roll approximately 38 inches wide and 492 feet long (173 square yards).

## 1. Site Preparation

The finished area, where the soil reinforcement mat is to be applied, should be shaped and free from stones, clods, or trash. The area covered should be prepared as a fine seedbed, fertilized and sprigged, if applicable, prior to installation. Areas to be seeded may be planted before or after installation.

Table 3.

Amount of Curasol AH Concentrate Per Acre						Amount of Water to Use Per Acre	
Flat Areas		Slopes		Channels, etc.		Moist Soil	Dry Soil
Drums	Gallons	Drums	Gallons	Drums	Gallons		
3	45	4	60	6	90	1000	2000

Cut a trench across the slope at the entry at least 6 inches wide and 12 inches deep. For water flow areas, cut a terminal trench and check slot trenches at 25 foot intervals. Cut all trenches 6 inches wide and 12 inches deep.

2. Applying the Soil Reinforcement Mat

When the mat is unrolled, the peak side shall be down. The mat shall be applied in the direction of the flow of water, staked into the entry trench, check slots, and terminal trench. The trenches should be back-filled and the soil tamped down in all trenches and slots.

When two or more lengths are needed end-to-end, each new roll shall be overlapped at least 6 inches. If installed in concentrated waterflow direction, new rolls shall be started with a transverse ditch.

When two or more widths are to be installed side-by-side, overlap the center strip by three inches.

3. Ground Fastening

Ground fasteners shall be wedge-shaped wood survey stakes with a minimum length of 12 inches or equivalent.

Use 3 stakes across the start of each roll in the entry trench prior to back-filling.

Stake at 4 foot intervals on all overlaps and throughout the length of the roll.

III. Fertilization – Nutrients are to be applied as per the guidance in the Nutrient Management Standard. An addition of 15 – 20 pounds of nitrogen is needed per ton of carbonaceous materials added to cropland fields. Woody mulch material requires additional nitrogen for the first 2 or 3 years of plant establishment.

IV. Fencing – Fencing should be planned as needed to control or exclude livestock or big game, or to regulate access by people.

**APPROVAL AND CERTIFICATION**

**MULCHING**

(Acre)

CODE 484

**PRACTICE STANDARD APPROVED:**

\_\_\_\_\_/s/ Monty Dollar\_\_\_\_\_

State Agronomist

\_\_\_\_7/19/01\_\_\_\_\_

Date

This practice standard is needed in the \_\_\_\_\_ Field Office Technical Guide.

\_\_\_\_\_

Natural Resource Manager

\_\_\_\_\_

Date

**CERTIFICATION:**

Reviewed and determined adequate without need of revision.

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Technical Specialist (Agronomy)

\_\_\_\_\_

Date

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Technical Specialist (Agronomy)

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Date